

Lesson 6-1 (pp. 282–289)

Rate of Change and Slope

Lesson Objectives 1 Find rates of change from tables and graphs 2 Find slope	NAEP 2005 Strand: Algebra Topic: Algebraic Representations Local Standards: _____
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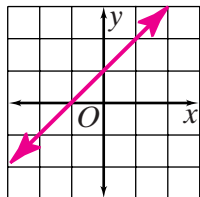
Vocabulary and Key Concepts

Slope

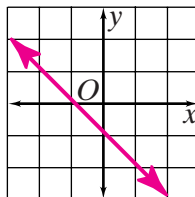
Slope is **the ratio of the vertical change to the horizontal change.**

$$\text{slope} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}, \text{ where } x_2 - x_1 \neq 0$$

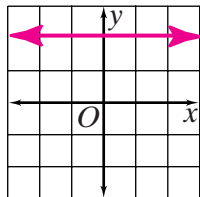
Slopes of Lines



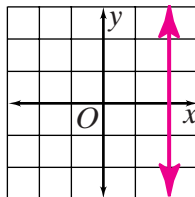
A line with **positive** slope slants upward from left to right.



A line with **negative** slope slants downward from left to right.



A line with a slope of 0 is **horizontal**.



A line with an undefined slope is **vertical**.

$$\text{Rate of change} = \frac{\text{change in the } \text{dependent} \text{ variable}}{\text{change in the } \text{independent} \text{ variable}}$$

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Examples

- 1 Finding Rate of Change Using a Table** For the data in the table, is the rate of change the same for each pair of consecutive mileage amounts?

Fee for Miles Driven	
Miles	Fee
100	\$30
150	\$42
200	\$54
250	\$66

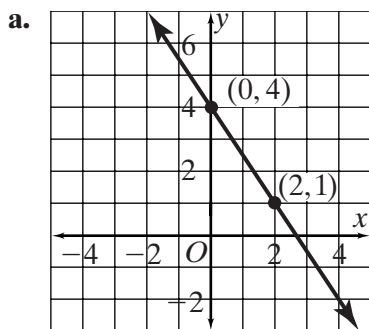
Find the rate of change for each pair of consecutive mileage amounts.

$$\text{rate of change} = \frac{\text{change in cost}}{\text{change in number of miles}} \quad \text{Cost depends on the number of miles.}$$

$$\begin{aligned} \frac{42 - 30}{150 - 100} &= \frac{12}{50} = \frac{6}{25} \\ \frac{54 - 42}{200 - 150} &= \frac{12}{50} = \frac{6}{25} \\ \frac{66 - 54}{250 - 200} &= \frac{12}{50} = \frac{6}{25} \end{aligned}$$

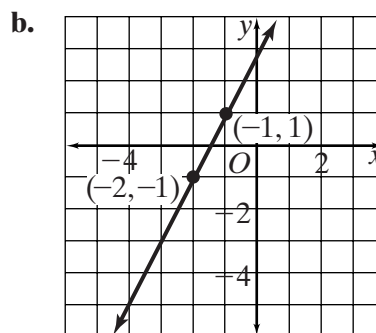
The rate of change for each pair of consecutive mileage amounts is \$ **12** per **50** miles. The rate of change is the same for all the data.

- 2 Finding Slope Using a Graph** Find the slope of each line.



$$\begin{aligned} \text{slope} &= \frac{\text{rise}}{\text{run}} \\ &= \frac{4 - 1}{0 - 2} \\ &= \frac{3}{-2} = -\frac{3}{2} \end{aligned}$$

The slope of the line is **$-\frac{3}{2}$** .



$$\begin{aligned} \text{slope} &= \frac{\text{rise}}{\text{run}} \\ &= \frac{-1 - 1}{-2 - (-1)} \\ &= \frac{-2}{-1} = 2 \end{aligned}$$

The slope of the line is **2**.

- 3 Finding Slope Using Points** Find the slope of the line through $E(3, -2)$ and $F(-2, -1)$.

$$\begin{aligned} \text{slope} &= \frac{\boxed{y_2} - y_1}{\boxed{x_2} - x_1} \\ &= \frac{\boxed{-1} - (-2)}{-2 - \boxed{3}} \quad \text{Substitute } (\boxed{-2}, \boxed{-1}) \text{ for } (x_2, y_2) \text{ and } (\boxed{3}, \boxed{-2}) \text{ for } (x_1, y_1). \\ &= \frac{1}{-5} = -\frac{\boxed{1}}{\boxed{5}} \quad \text{Simplify.} \end{aligned}$$

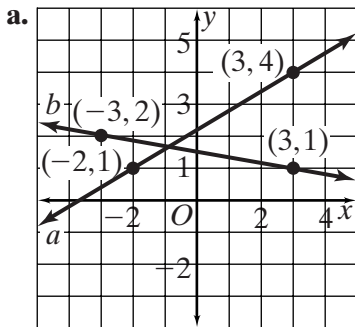
The slope of \overleftrightarrow{EF} is $\boxed{-\frac{1}{5}}$.

Check Understanding

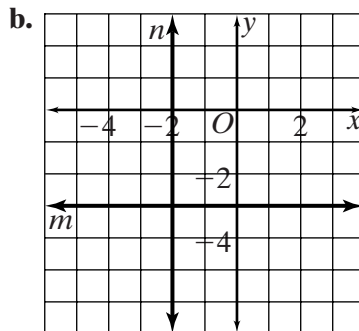
1. Using the table in Example 1, find the rate of change using mileage amounts 100 and 200.

$$\boxed{\frac{24}{100} = \frac{6}{25}}$$

2. Find the slope of each line.



a has slope $\frac{3}{5}$;
 b has slope $-\frac{1}{6}$.



m has slope 0;
The slope of n is undefined.

3. Find the slope of the line through each pair of points.

- a. $C(2, 5)$ and $D(4, 7)$

$\boxed{1}$

- b. $P(-1, 4)$ and $Q(3, -2)$

$\boxed{-\frac{3}{2}}$

- c. $M(a, b)$ and $N(c, d)$

$\boxed{\frac{d - b}{c - a}}$